

A scenic landscape photograph of a grassy field with a forested ridge and a prominent butte under a cloudy sky. The foreground is a dry, grassy field with some small shrubs. In the middle ground, there is a line of evergreen trees. In the background, a large, flat-topped butte rises prominently against a blue sky with scattered white clouds. The overall scene is a natural, open landscape.

Why Source Removal?

An overview of source removal sites in Montana

Source Removal Benefits

- **Most rapid cleanup method**
- **Removing source material prevents further contaminant spreading**
- **Immediately improves soil and groundwater conditions**
- **May prevent direct contact to PVC waterlines**

Source Removal Benefits

- Removes long-term liability
- Most importantly: Expedites remediation, decreases time to closure, and reduces long-term remediation costs

Some Examples of Source Removal Sites

- **Absarokee Bus Barn – Absarokee**
- **Ezzie's Wholesale - Chinook**
- **Circle R Services – East Glacier Park**



Absarokee Bus Barn

Absarokee Bus Barn



Case Incident #1 - Absarokee Bus Barn



Site Data

- 1,000 gal. gasoline UST removed 1998
- Cause of release: overfills
- 18 cubic yards excavated
- Coarse sand and gravel aquifer
- Shallow water table, approx. 5 feet bgs

Remediation

- 18 cubic yards treated in an on-site biopile
- 10,600 ppm TPH in soil in contact with groundwater
- Sheen on water table
- 3 monitoring wells installed
- Low dissolved BTEX concentrations

Results

- 4 quarterly groundwater monitoring events
- Contaminants below DEQ standards
- Site closed in 2001

Costs

- **Excavation, backfill, compaction, confirmation sampling, biopile sampling \$1,645.00**
- **Environmental Consulting: \$6,436.00**
- **Total Project Costs: \$8,081.00**

Case Incident #2 - Ezzie's Wholesale - Chinook, MT



Ezzie's Wholesale: Chinook, MT.

- **Dec. 1995: Leak reported in gasoline supply lines**
- **GW/Soil investigation completed**
- **Fine-grained silty-clay soil**
- **GW 4.5 - 8ft. bgs**
- **High BTEX, TPH in soil and GW**
- **No DW taste or odor complaints**

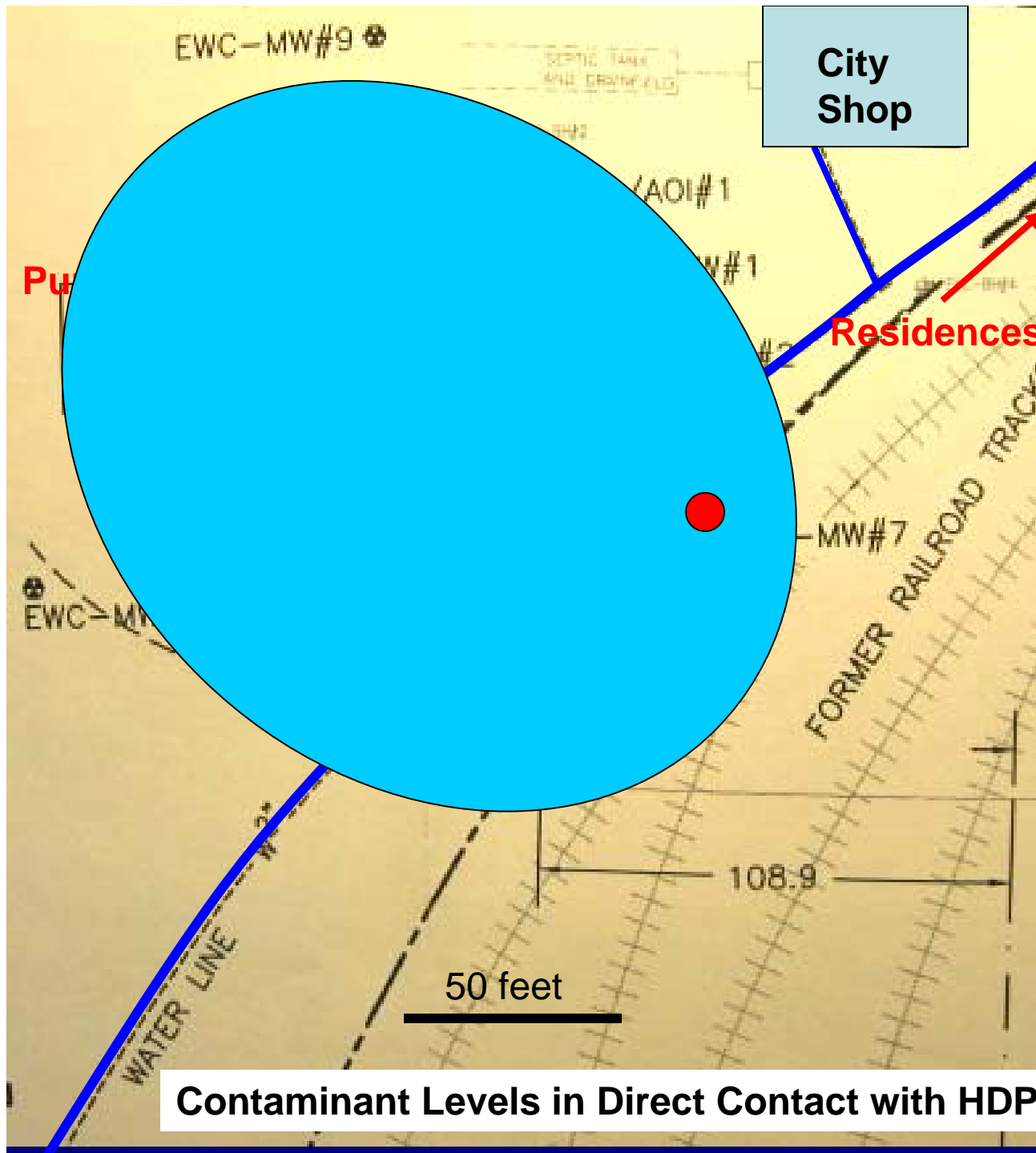
Chinook, Montana

- **June 1997: Tap water sample from bulk plant office confirmed BTEX present in water supply line**
- **Aug. 1997: BTEX confirmed in tap water samples from adjacent 2 houses and 2 commercial properties**

Ezzie's Wholesale – Initial Tap Water Samples

Location	Benzene	Toluene	Ethylbenzene	Xylene
<i>MCL</i>	<i>5</i>	<i>1,000</i>	<i>700</i>	<i>10,000</i>
Ezzie's Shop	6.3	3.7	1.3	<0.50
Residence #1	6.6	< 0.50	<0.50	< 0.50
Residence #2	5.8	< 0.50	< 0.50	< 0.50
Depriest Truck	< 0.50	< 0.50	0.26	1.4
S. Beet Factory	< 0.50	< 0.50	0.60	3.5
Asphalt Refin.	3.2	3.2	0.95	4.0

Results in ppb



MW-7

GW approx. 5 – 8 ft. bgs

Benzene range:
13,500 – 34,300
ppb

TPH (total
purgeable):
46,300 -95,700
ppb

Contaminant Levels in Direct Contact with HDPE Waterline

Remedy

- **Nov. 1997: HDPE Waterline replaced with 1-inch copper line**
- **Adjacent contaminated soil removed and landfarmed**
- **Additional soil removal and site remediation planned for 2007**





Soil contamination

HDPE Piping

1997 Waterline Replacement



O/O noted a “slight odor present” on 30-day release form

PID readings using heated headspace:

>2,000 ppm (Mini-Rae PID)

Circle R Services
E. Glacier
Fac. ID# 18-05188 (3603)
11/17/00

Case Incident #3: Circle R Services East Glacier Park

Highway 2

Circle R Services

- Gas station since 1962 (Standard Oil)
- Five USTs, 2 pump islands
- Release notified in Dec. 1998
- 730 cubic yards removed at time of UST removal

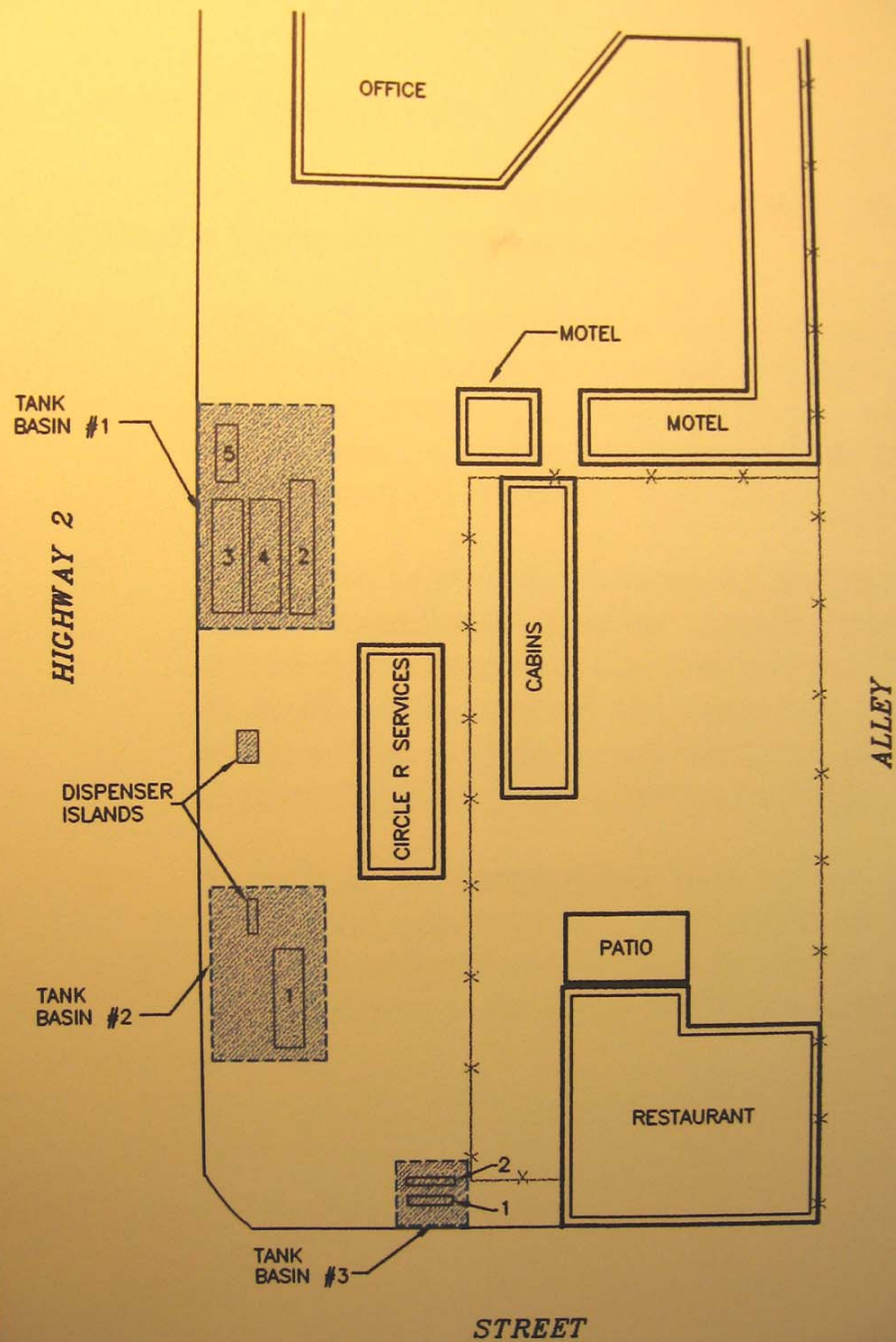
Phase II GW Investigation (Geoprobe)

- **Shallow GW: 8.5 feet bgs**
- **High PID readings in soil**
- **High BTEX in monitoring wells**
- **5 of the 15 Geoprobe points completed as monitoring wells (MWs)**

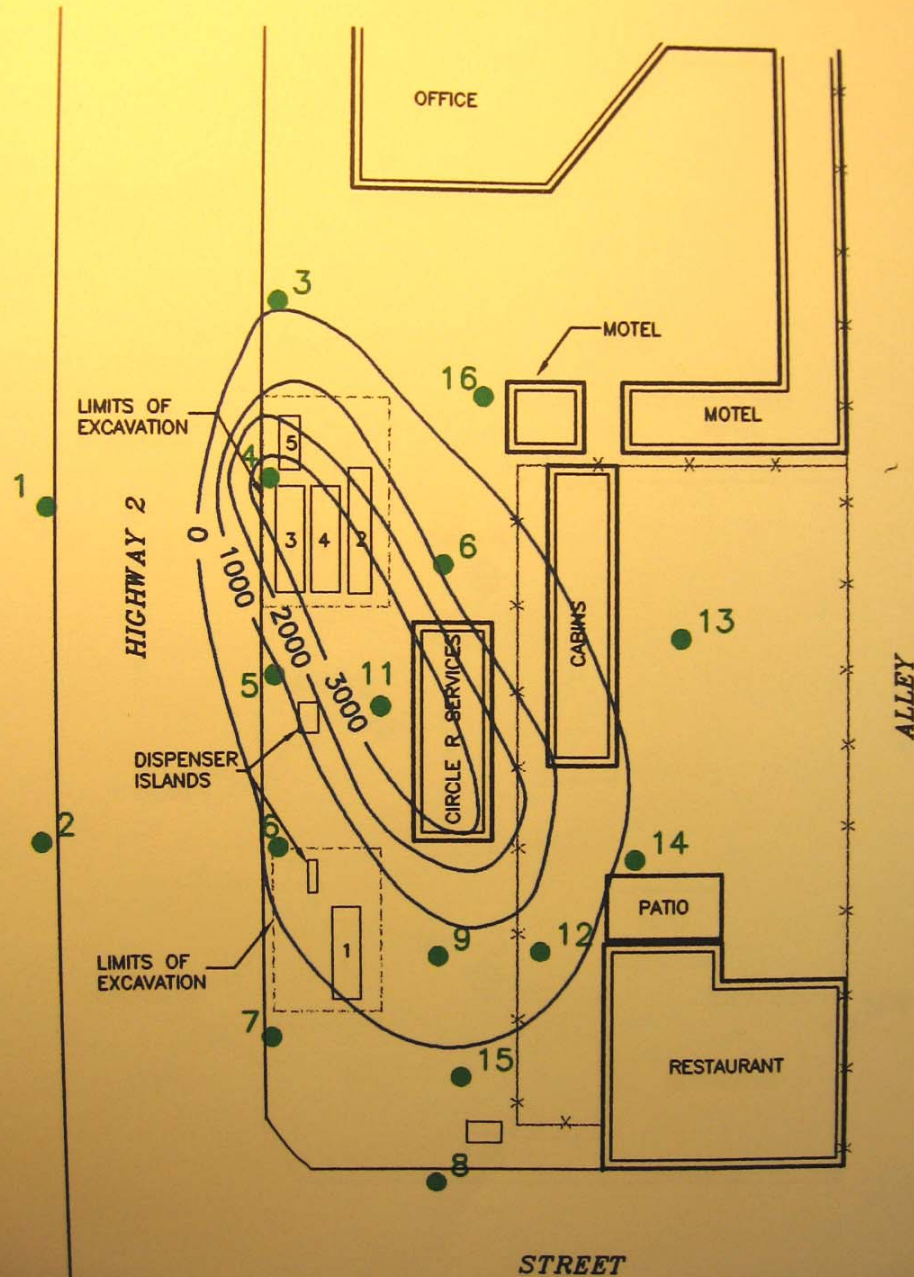
Phase II GW Investigation (Geoprobe)

- 3 of the 5 MWs had high benzene
- High residual contamination in area between the 2 former UST basins
- Addl. tank basin with 2 USTs (1,000 gal and 2,000 gal.) discovered
- Consultant's recommendation: remove the residual source material

Base Map with UST Basins



Base Map with VPH plume



2000 Phase II Source Area Removal

- **1247 cubic yards removed and landfarmed**
- **MW-2 removed during excavation**
- **Post excavation soil sampling (8 sidewall confirmation samples)**
- **Only 1 benzene exceedance**
- **Very low TPH concentrations**
- **Groundwater sampling: concentrations dropped below standards within 2 quarters**

Circle R Services – East Glacier



Circle R Services – East Glacier



Circle R Services – East Glacier



2001 GW Data

- All wells below action levels except for well MW-4
- MW-4
 - 0.6 ppb Benzene
 - 116 ppb C9-C10 aromatics

Final Site Data

- **MW-4 dropped below action levels in late 2004**
- **GW sampling ceased after 2004 event**
- **Landfarm site sampling continued through 2006**
- **Landfarm sites (2) closed in late 2006**
- **Circle R Services site closed in late 2006**

Cost Summary

- **Phase I Excavation* = \$30,000.00**
- **Phase II Excavation* = \$80,000.00**
- **Environmental Consulting = \$91,000.00**
- **Total Project Costs = \$201,000.00**

(*soil excavation, hauling, compaction, backfill, landfarming, and concrete removal/replacement)



Conclusions:

- Some degree of source removal is almost always warranted (e.g., at the time of UST removal)
- Source removal is the best remediation option for immediately reducing contaminant levels in most fine-grained soil types
- In some cases, years of in-situ cleanup and ongoing monitoring may be saved by simply removing the source of contamination

A scenic mountain landscape. In the foreground, a rocky outcrop with horizontal sedimentary layers is visible on the left. Below it, a dense forest of evergreen trees covers the valley floor. A river winds through the forest, reflecting the sky. In the background, several mountain peaks are visible under a clear blue sky. The word "Questions?" is written in large, bold, yellow letters across the center of the image.

Questions?